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**END SEMESTER REGULAR / RETEST  
EXAMINATION, JULY-2023**

Branch : Chemical Engineering

Semester : 4th (New)

Subject Code : Ch-403

**FUEL, FURNACE AND REFRACTORIES**

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks  
for the questions.

**Instructions :**

- (i) All questions of PART-A are compulsory.
- (ii) Answer any five questions from PART-B.

**PART – A**

**Marks – 25**

1. Choose the correct answers :  $1 \times 5 = 5$ 
  - (a) Characterization of paraffinic crude is
    - (i) equal to or less than 12
    - (ii) equal to or greater than 12
    - (iii) equal to or greater than 10
    - (iv) equal to 5

[Turn over

(b) Uranium-235 is an example of

- (i) by-product fuel (ii) nuclear fuel
- (iii) chemical fuel (iv) fossil fuel

(c) Colour of crude is

- (i) from light brown to dark brown
- (ii) blue
- (iii) from light blue to dark blue
- (iv) red

(d) Main purpose of carbonization is to produce

- (i) Coal (ii) Coke
- (iii) Petrol (iv) Diesel

(e) Main constituents of producer gas is

- (i) CO, N<sub>2</sub> (ii) H<sub>2</sub>, CO<sub>2</sub>
- (iii) O<sub>2</sub>, NO (iv) C, NO<sub>2</sub>

2. Fill in the blanks :  $1 \times 10 = 10$

(a) Cleaveland apparatus is \_\_\_\_\_ cup.

(b) In lignite coal, % of carbon is \_\_\_\_\_.

(c) Combustion rate of coal can be \_\_\_\_\_ by pulverization.

(d) % of hydrogen in crude oil is \_\_\_\_\_.

(e) Cloud point is the important property of \_\_\_\_\_.

(f) \_\_\_\_\_ desalter is more efficient and economical.

(g) Natural gas is a mixture of \_\_\_\_\_ hydrocarbons.

(h) In furnace, there is \_\_\_\_\_ to retain heat at high temperature.

(i) Fire clay is an example of \_\_\_\_\_ refractory.

(j) Wind energy is an example of \_\_\_\_\_ energy.

3. State True or False :  $1 \times 10 = 10$

(a) Petroleum is an example of renewable energy.

(b) Dolomite is an example of basic refractory.

(c) Furnace efficiency does not depend on flame temperature.

(d) Water gas is used as a fuel in furnace.

- (e) Product taken out from the side of distillation column are called draw off.
- (f) Reboiler maintains the top temperature of a distillation column.
- (g) Temperature of low temperature carbonization is 11,000 Centigrade.
- (h) Ash content is low in coal.
- (i) Geothermal energy is heat derived within the sub-surface of earth.
- (j) Combustion of CNG is more regular.

## PART – B

Marks – 45

- 4. Write short notes on :  $3 \times 3 = 9$ 
  - (a) Anilene point
  - (b) Cracking
  - (c) Base of crude.
- 5. (a) Explain the theories behind the origin of coal. 4
  - (b) What do you mean by rank of coal ? Classify coal on the basis of rank. 5

6. Describe two stage distillation operations of crude with suitable diagram. 9

7. (a) What do you mean by nuclear energy ? Give examples. 3

(b) Distinguish between renewable and non-renewable energy. 3

(c) Explain Solar energy with uses. 3

8. Describe the manufacturing process of producer gas with diagram. 9

9. (a) Describe the construction, operation and uses of Muffle furnace. 6

(b) What are the factors affecting the economy of a furnace ? 3

10. (a) What are the basic properties of a refractory ? 4

(b) Explain the manufacturing process of silica refractory with uses. 5